ABSTRACT

A method is described for a plasma treatment of a $TiCl_4$ based CVD deposited TiN layer that reduces stress, lowers resistivity, and improves film stability. Resistivity is stable in an air ambient for up to 48 hours after the plasma treatment. A TiN layer is treated with a N-containing plasma that includes N_2, NH_3, or N_2H_4 at a temperature between 500°C and 700°C. Optionally, H_2 may be added to N_2 in the plasma step which removes chloride impurities and densifies the TiN layer. The TiN layer may serve as a barrier layer, an ARC layer, or as a bottom electrode in a MIM capacitor. An improved resistance of the treated TiN layer to oxidation during formation of an oxide based insulator layer and a lower leakage current in the MIM capacitor is also achieved.